Maine Healthy Beaches
Quality Assurance Project Plan (RFA16085)

2016-2021

Prepared by: Keri Kaczor, University of Maine Cooperative Extension/Maine Sea Grant

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1. Title and Approval Sheet (RFA16085)

Approved by:

Alicia Grimaldi, U.S. EPA, Project Officer/Region 1 Coordinator

Alicia J Grimaldi

Signature Date 7/21/2016

Nora J. Conlon, U.S. EPA, Quality Assurance Officer

Nora J Conlon

Signature Date 7/21/2016

Andy Johnson, ME DEP, QAPP Review Coordinator

Andrew Johnson

Signature Date 7/18/16

Colin Clark, ME DEP, Project Manager

Signature Date 7/19/16

Keri Kaczor, UMaine Extension/Sea Grant, Project Coordinator

Keri L. Kaczor

Signature Date 7-5-16

Additional reviewers:
Jennifer Jamison, Laboratory Certification Officer, Maine Division of Environmental Health
Christine Blais, Maine Division of Environmental Health
Lorri Maling, Laboratory Manager, Nelson Analytical Laboratory
Susanne Meidel, Maine Department of Environmental Protection
Meagan Sims, UMaine Cooperative Extension, Maine Healthy Beaches
Colin Clark, Maine Healthy Beaches Project Manager, Maine Department of Environmental Protection
Mary Ellen Dennis, Maine Department of Environmental Protection

Funding for the Maine Healthy Beaches Program is provided annually by US EPA under section 406 of the Clean Water Act (CWA), as amended by the Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH Act).

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3. Distribution List

Any changes that will require modification to the approved QAPP will be documented and distributed via the list below. These modifications will be reviewed by all project personnel and then forwarded to US EPA for comment, review, and approval.

Alicia Grimaldi, Project Officer
U.S. EPA
5 Post Office Square, Suite 100
Mail Code: OEP06-01
Boston, MA 02109
617-918-1806; grimaldi.alicia@epa.gov

Nora Conlon, Quality Assurance Officer
U.S EPA
11 Technology Drive
N. Chelmsford, MA 01863
617-918-8335; conlon.nora@epa.gov

Jennifer Jamison, Laboratory Certification Officer
Maine CDC/Health and Human Services
11 State House Station
Augusta, ME 04333
207-287-1929; jennifer.jamison@maine.gov

Andy Johnson; QAPP Review Coordinator
ME DEP Augusta, ME 04333
17 State House Station
Augusta, ME 04333
207-287-7047; Andy.Johnson@maine.gov

Nancy Beardsley, Director-Division of Environmental Health
Maine CDC/Health and Human Services
11 State House Station
Augusta, ME 04333
207-287-5674; nancy.beardsley@maine.gov

Don Witherill, Director-Division of Environmental Assessment
ME DEP
17 State House Station
Augusta, ME 04333
207-215-9751; Donald.T.Witherill@maine.gov

Colin Clark, Program Manager
ME DEP 17 State House Station
Augusta, ME 04333
207-441-7419; colin.A.Clark@maine.gov

Keri Kaczor, Program Coordinator
UMaine Extension/Sea Grant
377 Manktown Rd.
Waldoboro, ME 04572
207-832-0343; keri.kaczor@maine.edu

Lorri Maling, Laboratory Manager
Nelson Analytical Laboratory
120 York St.
Kennebunk, ME 04043
207-467-3478; lmaling@nelsonanalytical.com

Jane Disney, Director of Education
MDI Biological Laboratory
P.O. Box 35 |
Salisbury Cove, ME 04672
207-288-9880; jdisney@mdibl.org

Peter Rush, Laboratory Technician
Portland Water District
PO Box 3553
Portland, ME 04104
207-774-5961; prush@pwd.org

4. Project/Task Organization

The Maine Department of Environmental Protection (ME DEP) manages the Maine Healthy Beaches (MHB) program and data and enters into a cooperative agreement with the University of Maine Cooperative Extension/Maine Sea Grant (UMaine Coop. Ext./SG) to provide project coordination (Figure 1). Keri Kaczor, located at the UMaine Extension office in Waldoboro, Maine is the statewide project coordinator. Meagan Sims, also with UMaine Extension, is the southern Maine field coordinator, located at the DEP office in Portland, Maine. A part-time seasonal intern also supports the midcoast region. This team works successfully with 28 diverse local management entities spanning over 200 miles of coastline (approx. 60 beach management areas from Kittery to Mount Desert Island). New beaches are recruited over time as resources and funding allow and/or circumstances change eligibility for program participation.

Program participation is voluntary and Maine law allows public use of private beaches for "fishing, fowling, and navigation" only. Participating beaches must have a management entity capable of meeting objectives outlined in MHB protocols and policies, as well as, the MHB Town/State Park Agreement Form (Appendix A). This includes a feasible plan for monitoring, assessment, and timely public notification of water quality conditions. Towns/parks designate local beach managers and field monitors. Parks and recreation directors, town administrators, health nurses, fire chiefs, state park managers, and others, often fulfill the beach manager role. Beach managers respond to the data and program initiatives and act as a liaison to field monitors, citizen scientists that are either local staff or volunteers. The field monitors are responsible for sample collection, sample transport to the courier pick-up location, and may assist with data entry. Beach managers rely on multiple individuals locally allowing for timely monitoring. If local volunteers are not available, lifeguards often resample sites. This redundancy, including training and equipping multiple individuals locally, facilitates timely monitoring and public notification of water quality conditions and protection of public health on Maine's coastal beaches.

Maine's coastal beaches are geographically dispersed, with the majority of beaches located in York County. MHB contracts with regional laboratories across the state located in close proximity to the coast and capable of meeting MHB program policies and needs. To augment the program's efforts to ensure safe and healthy beaches, a Technical Advisory Committee supports program initiatives such as review/evaluation of assessment tools, protocols, policies (e.g. beach action value), etc. This Committee is comprised of microbiologists, public health professionals, laboratory technicians, local and state resource managers, researchers, and others. This groups meets annually or more frequently depending on program needs.

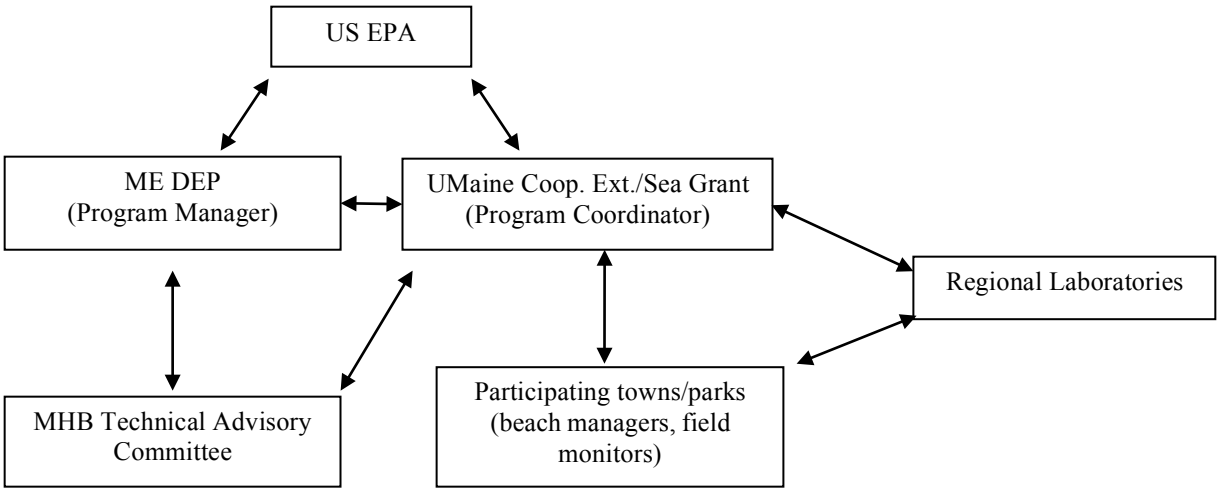

Figure 1. MHB program organization.

Nelson Analytical (Figure 2), the program's reference laboratory, provides a courier service and processes the majority of samples. Portland Water District (PWD) processes samples for Portland's East End Beach. UMaine Extension/SG processes samples in the midcoast region. For the program's most northern beaches (Mt. Desert Island region), samples are processed by the Community Environmental Health Laboratory (CEHL) at the Mt. Desert Island Biological Laboratory (MDI BL). Figure 2 shows the relationship between Nelson Analytical and the other three labs analyzing MHB samples.

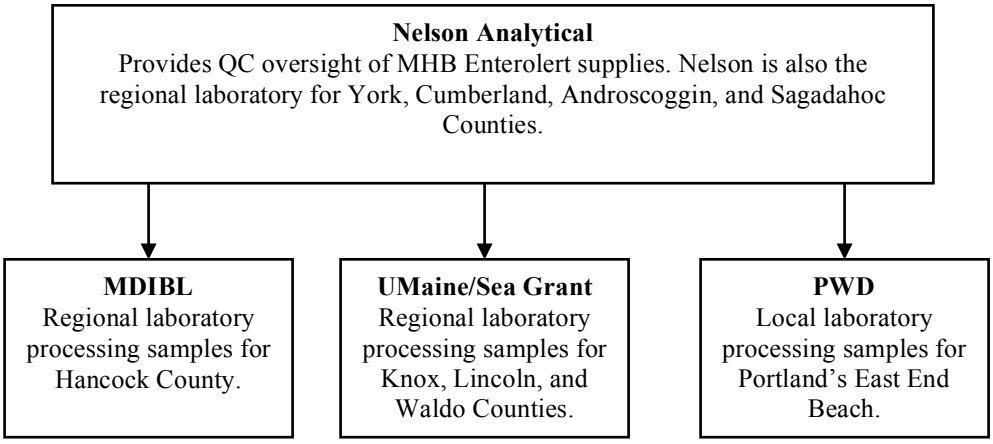

Figure 2. Laboratories analyzing MHB samples.

MHB works with a cadre of municipal officials, local staff, volunteers, laboratories, and agency partners to successfully implement monitoring, assessment, and notification of coastal beach water quality. Communication pathways among these partners are shown in Figure 3. With so many entities involved, efficient and timely communication is essential. To expedite information transfer, an extensive communication plan of local beach managers and field monitors is updated (annually and as needed) for re-sampling efforts and beach status notification.

MHB also delivers workshops to address chronic bacterial pollution. These face-to-face activities and tools enhance communication and help ensure the needs of all parties are being met. However, the level of support and area covered depends on funding and staff. Since its inception, MHB has solicited the feedback of partners at all levels for program needs and development. MHB continues to evaluate and adapt the program as needed. MHB also responds to numerous data and information requests throughout the year, and develops and broadly distributes materials promoting best practices at the beach and throughout the watershed (Appendix B). Diverse audiences are reached through presentations, newspaper, television, and radio interviews.

MHB works to build local capacity to find, fix, and prevent pollution. An integral component is bringing together partners in a collaborative process focused on sharing resources and solving problems. Since 2003, MHB has provided extensive support to communities struggling with pollution issues. Some examples include boater, pet owner, and septic user education/outreach campaigns; circulation studies; enhanced monitoring of multiple parameters; GIS risk assessment/watershed modeling; in-depth data analysis; microbial source tracking; sanitary survey work; trainings; and stakeholder workshops. Support for tackling bacterial pollution on beaches and shellfish-growing areas continues through the *Municipal Guide to Clean Water: Conducting Sanitary Surveys to Improve Coastal Water Quality*. More recently, this work also

includes applied research partnerships in Maine and beyond including collaboration with biophysical and social science researchers on the New England Sustainability Consortium (NEST) safe beaches and shellfish project.

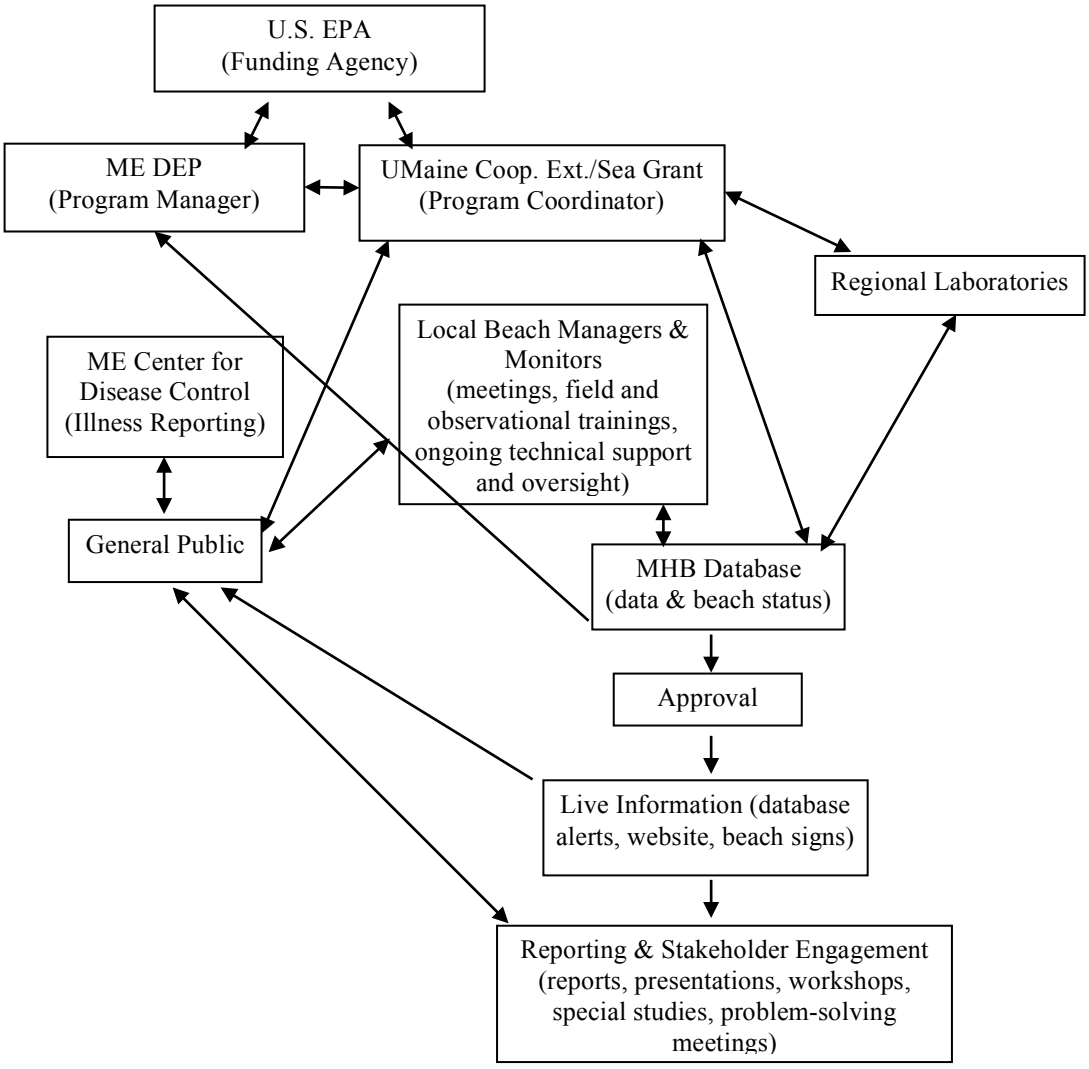

Figure 3. Communication pathways between MHB and collaborators.

5. Problem Identification/Background

. Unsafe bacteria levels degrade ecosystems and threaten human health and economies largely based on tourism. Of primary concern are the microorganisms that have the potential to cause human illness (human pathogens) which fall into three categories: viruses, bacteria, and parasitic protozoa. These pathogens interact with humans via exposure, infection, and illness. Exposure can occur through direct contact (e.g. open wound), ingestion, or inhalation. Infection depends on the virulence of the pathogens and the susceptibility of the host, and illnesses differ in their severity and symptoms (US EPA 2015). Commonly reported diseases contracted from contaminated recreational waters include gastrointestinal illness, respiratory illnesses, skin rashes, and ear, eye, and wound infections. Typically, those at a greater risk of contracting a recreational water-borne illness are young children, elderly, and persons with compromised immune systems.

A great diversity of pathogens exist that can affect human health, and the types and numbers of

pathogens present is determined by the source and magnitude of fecal contamination. Currently, it is not feasible to adequately assess all the pathogens reaching a given water body; therefore, the U.S. Environmental Protection Agency (US EPA) recommends that states use the culturable fecal indicator bacteria (FIB), *Enterococcus* sp., for marine recreational waters. *Enterococcus* sp. naturally occurs in the guts of warm-blooded animals, including humans, and epidemiological studies have determined this FIB is a good estimator of the amount of fecal contamination and indirectly, the presence and quantity of fecal pathogens in recreational waters.

In response to growing concerns regarding the human health effects from contaminated recreational waters, Congress approved grant funding to eligible states to implement coastal recreation water monitoring and public notification programs under section 406 of the Clean Water Act (CWA), as amended by the Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH Act). These federal BEACH Act funds are promulgated through the US EPA and are used by qualifying states for monitoring, assessment, and notification of beach water quality conditions.

Local beach managers use MHB data to make informed management decisions in support of public health. If any beach site exceeds the established safety limit for recreational water contact, MHB recommends a contamination advisory, and in extreme cases of known pollution events or other safety hazards, a closure. Once the data is available and the local decision is made to post the beach (or local precipitation levels exceed the trigger for the typical worst-case scenario for water quality), the information is instantaneously made publically accessible (Figure 3) via the MHB website. An automatic email alert is also sent to local beach managers, MHB staff, and state agency partners. UMaine Extension/SG staff contacts the regional laboratories and local jurisdictions via telephone, FAX, or email to ensure that MHB protocols are followed in a quality-assured, timely manner. MHB signage (Appendix C) is posted at major beach access points and several beaches have provided supplemental signage to communicate local risks (e.g. stagnant tide pools, river/stream outlets following rainfall). In some cases, public notification also occurs via local websites, Facebook, hotlines, etc. Data are also used to determine problematic areas needing additional monitoring, survey work, and/or pollution remediation (e.g. illicit detection and elimination projects, watershed management plans).

6 Project/Task Description

There are more than 29 miles of public-access beaches stretching along Maine's coast. MHB is Maine's only unified and quality-assured structure for protecting public health on coastal beaches. A typical grant/project year is shown in Table 1.

Table 1. Project schedule.

Task	Date
Planning and problem-solving meetings; educating new beach managers; presentations	Ongoing; late winter/early spring
Regional beach manager meetings; review of beach locations, schedules, communication plans, etc.	Spring
Field, laboratory, and database trainings/follow-up observations of field monitors	Spring through late summer
Routine beach monitoring	The week of Memorial Day through the

Task	Date
	week of Labor Day; frequency ranges from 3/week to 1/month
Data entry/validation	Daily when samples are processed; the week of Memorial Day through the week of Labor Day
Data evaluation/QC assessment	Daily when samples are processed; the week of Memorial Day through the week of Labor Day
Data reporting; submission to US EPA	Ongoing; US EPA deadline Jan. 31
Special studies/sanitary surveys	Ongoing as needed, May through October; contingent on funding
Development of education/outreach materials and stakeholder engagement	Ongoing
Annual and special study reports; GIS/data support	Late winter/early spring; US EPA narrative due April 1; ongoing

U.S. EPA funding supports monitoring of sandy, moderate to high-use beaches with adequate public access and facilities (e.g. guards, restrooms). In 2015, MHB successfully worked with 28 local management entities to monitor 60 coastal beaches with the majority located in York and Cumberland counties. *Enterococci sp*. levels are monitored alongside additional environmental parameters (Table 2). The standards used for *Enterococcus* sp. are provided by the US EPA (Appendix D) and have been adopted as a Maine guideline, while the remaining parameters are collected using standard methodologies. The single sample maximum (SSM) is 104 Most Probable Number (MPN) of *enterococci* per 100 ml. A geometric mean of 35 MPN per 100 ml. based on 5 or more samples collected within a 30-day period is also used to determine the overall health of the water body (U.S. EPA 1986). When recorded levels exceed the SSM, an advisory is recommended and sites are resampled as soon as possible. The monitoring frequency may increase until results are within acceptable limits.

7. Data Quality Objectives for Measurement Data

Data must be indicative of true water quality conditions to correctly assess the sanitary condition of the beach.

Precision, Accuracy/Bias and Completeness

If any of the samples exceed the acceptable precision or accuracy/bias criteria, the affected sample results are qualified in the reporting. If QA/QC requirements are not met, the data is "flagged" and details reported in the MHB database and to the MHB Program Coordinator. Such qualification of the results is considered when making recommendations for swimming advisories and closures. In addition, a QA report is sent to the Program Coordinator for inclusion in a program-wide QA/QC analysis and for record keeping purposes.

Precision of field duplicates:

A minimum of 10% of samples are duplicated in the field by simultaneously collecting two samples from the same location using identical monitoring methods. The samples are analyzed as any typical field sample is. The Relative Percent Difference (RPD) for field duplicates is calculated using the formula:

$$RPD = (|X_1-X_2| / (X_1+X_2)/2)*100$$

X_1 represents the count for the first sample and X_2 the count for the second sample. RPD is always positive because the numerator is an absolute value. The RPD control limits were derived from MHB data (2006-2015). All duplicates with one sample below the detection threshold (10 MPN) were omitted. The acceptable RPDs are equal to the Control Limits (CL) of the Field and Lab Duplicate data, independently. CL = AvgRPD + (3 x StdDevRPD) and has a statistical confidence limit of 99%, meaning that only 1 out of 100 RPDs should exceed the CL. The RPD is calculated on a monthly basis and field practices are reassessed for RPD values that repeatedly exceed the established CL (see Table 2 and Appendix E).

Precision of lab duplicates and analysts:

For additional QA/QC, the laboratory performs analyses on lab duplicates, checks the precision of a single analyst, or checks the precision among analysts. A lab duplicate is analyzed for every 10 samples and entails processing two samples from the same sample container. This is accomplished by either simultaneously extracting 10 ml of sample water for each sample or extracting the first 10 ml, re-closing and re-shaking the sample container, and extracting the second 10 ml of sample water. The RPD is calculated on a monthly basis using the calculation above and laboratory practices are reassessed for RPD values exceeding the established CL (see Table 3 and Appendix E). Repeated counts from a single Quanti-tray should be within 5% for a single analyst and counts from a single Quanti-tray should be within 10% among analysts. The precision of the analysts is quality checked before each result is entered into the MHB database.

Bias of Method/Laboratory

According to standard methods, the method bias for IDEXX Enterolert® is not significant. With no significant method bias, the laboratory bias is equal to the RPD of laboratory duplicates and analysts.

Data Representativeness
At coastal beaches, the number of samples collected per beach ranges from one to fifteen depending on the linear distance and characteristics of the beach management area. In addition, several upstream, non-bathing areas may be sampled where the potential for contamination from wildlife/runoff exists.

Comparability
Each monitoring station is fixed and located by reference to a permanent landmark at each beach and via GPS coordinates. MHB has generated publically accessible GIS files of all beaches and monitoring stations. The stations do not change throughout the monitoring season but vary with tidal stage. Each field crew is trained as to the location of each station and how to collect the sample in a quality-assured manner. Data collection procedures are based on standard methodologies (APHA 2012, Stancioff 1996). The enterococci analysis method used by laboratories is U.S. EPA-approved for ambient water testing.

Completeness
It is expected that at least one sample is collected from each beach location weekly (See MHB Tiered Monitoring Plan, Appendix F) throughout the monitoring season with the addition of

approximately 20% QC samples (field and laboratory) of total samples collected. It is expected that data is reported from greater than 95% of the samples collected.

Table 2. Field collection parameters.

Parameter	Preservation/ Holding Time	Equipment	Precision	Accuracy	Detection Limit
Enterococcus sp.	Grab sample chilled to ≤ 10ºC; 6 hours from collection to laboratory set up	Sterile whirl-pak bag; tongs; cooler and ice	10% duplicated CL ≤ 176%.	N/A	N/A
Water & Air Temperature	In situ	Thermometer	N/A	N/A	1°C
Salinity	In situ	Pipette; refractometer	N/A	Calibrated with DI water	1 ppt
Tidal Stage	In situ	N/A	N/A	Tidal calculator (database)	N/A
Rainfall	Antecedent (48hrs)	Rain gauge	N/A	Weather station; website	0.1 inch
Observations (water surface, current, seaweed, wildlife/pets, turbidity, boats, etc.)	In situ	N/A	N/A	N/A	N/A

Table 3. Laboratory analysis for *Enterococcus sp.*

Method	Sample Volume	Dilution	Detection Limit	Measurement Range	Incubation Temp.	Precision	Accuracy
Enterolert ® Most Probable Number (MPN)	100mls	1:10	1 MPN	<10 MPN to > 24,196 MPN	41 +/-0.5 degrees C	10% duplicated CL ≤144%	Lab blank

8. Training Requirements/Certification

In the event a new beach is added and/or a new person is designated as beach manager, MHB staff meet face to face with local staff to determine a feasible plan for monitoring, assessment, and timely public notification of water quality conditions. Local beach managers designate staff and/or volunteers to collect samples and enter field data into the MHB database. UMaine Extension/SG has developed all trainings and protocols and partnering agencies have reviewed these practices. IDEXX, the Maine Departments of Environmental Protection and Marine Resources, and the Maine Center for Disease Control (ME CDC) provide assistance as needed. The MHB Program Coordinator also provides one-on-one trainings/consultations as needed to new laboratory technicians, agency partners, etc.

To ensure the quality of data collected and the effectiveness of the program, all field monitors are required to attend an extensive 2-hour training module annually before the monitoring season commences. The group size and location are strategically planned and organized to meet the interests of the program, the community, and the monitors. Each monitor is carefully tracked via a sign-in sheet and is required to sign an outline of expectations (see Appendix G). Field monitors are provided with a comprehensive training packet and UMaine Extension/SG staff share important program information and updates. Staff demonstrate the field protocol and each participant must demonstrate competency in collecting samples and recording data in a quality-assured manner. Participants must also understand and comply with safety practices.

Database trainings are provided to designated local contacts and/or new laboratory staff. During the initial training, MHB staff demonstrate the process via computer, sign out, and then the trainee must demonstrate all steps correctly. MHB staff provide database technical assistance and refresher trainings as needed. A sub-set of monitors also receives a one-on-one field follow-up/observation training during the course of the season. This includes but is not limited to monitors that are new, haven't had a follow-up in two years, communicated they would appreciate the support, etc.

Table 4. MHB trainings.

Training Type	Description	Trained by	Frequency	Trainees
Field Sample Collection	Trainings for monitoring SOP; safety	UMaine/SG; agency partners as needed	Every Spring; ongoing	All field staff
Observational/Follow-up	QA/QC; support	UMaine/SG	As needed	A sub-set of field staff (e.g. new monitors)
Laboratory Analysis	Enterolert ® methodology; laboratory safety; QA/QC practices	UMaine/SG; IDEXX; ME CDC; US EPA	Every Spring; as needed	All new regional laboratory staff, agency partners
Data Management	Field & laboratory records; beach status; attributes	UMaine/SG; ME DEP	Initial; as needed	Field monitors, municipal staff, laboratory staff, agency partners

9. Documents and Records

Field Notes

Field datasheets track relevant information such as monitoring date, time, field collection staff, site location, collection time, and other pertinent environmental parameters and observations. This information is quality-checked and transferred by trained staff or volunteers into the MHB Program database within 24 hours of sample collection. This web-based system provides volunteers, laboratory technicians, and data managers central access to environmental data (field and laboratory) for coastal beach water quality in Maine. The system uses a Microsoft SQL server to store and process data. Data is stored in the MHB database (periodically backed-up on an external drive) indefinitely and all hard copies of field datasheets are kept on file for at least 5 years. Data is transferred to ME DEP's EGAD system (backed-up nightly) and US EPA databases (STORET and PRAWN) annually and stored indefinitely.

Sample Chain of Custody

Hard copies of Chain of Custody forms are kept on file for at least 5 years.

Laboratory Analytical Records

Within 1 hour of results being available, the regional laboratories access the existing online record and enter the date and time of analysis, date and time of results, and the corresponding enterococci results for each site 26-32 hours after collection. Each record is carefully quality-checked before final submission into the database by the same analyst or by second analyst if available. Laboratory results are stored in the MHB database indefinitely and all digital and hard copies of laboratory reports, QC documentation, and laboratory bench sheets are kept on file for at least 5 years. Data is transferred to ME DEP's EGAD system and US EPA databases (STORET and PRAWN) annually and stored indefinitely.

QA/QC Documentation

All field and laboratory duplicate information is stored in an Excel file. Other QA/QC project records such as routine quality checks and calibration of equipment (field and laboratory), quality checks of supplies and materials, annual QA/QC checklists, notes summarizing any issues and remediation steps, etc. are stored in both digital and hard-copy form. All program QA/QC documentation is kept on file for at least 5 years.

Other Documentation

An extensive inventory including all beaches, sample sites, local contacts, pollution sources, how often resamples are clean, etc. is updated annually (and as needed) to facilitate well-informed beach management decisions. Reports such as US EPA annual reports, special studies, public reports, illnesses, etc. are kept in both digital and hard copy form for at least 5 years.

10. Monitoring Process Design

Annually, approximately 2,000 samples are collected at over 130 routine and enhanced monitoring locations. Monitoring frequency depends on the beach Tier (Appendix F) and ranges from once per month to more than once per week. The monitoring season lasts approximately three months (90-100 days), and typically extends from the week of Memorial Day through the week of Labor Day. The season can be extended for interested groups and special studies. The town/park personnel along with UMaine Extension/SG select the monitoring sites for each beach

based on US EPA recommendations: sites where people swim, sites at sources of freshwater inputs to the beach, and sites dependent on local knowledge of any conditions affecting water quality. In addition, whenever feasible, several upstream, non-bathing areas are sampled where the potential for fecal contamination exists.

11. Monitoring Method Requirements

Monitors follow standard monitoring procedures for each monitoring site, see Appendix H.

12. Sampling Handling and Custody Requirements

The Chain of Custody (Appendix H) documents the control and transfer of samples throughout the collection and transport phases as well as the cooler temperature. Samples remain in the custody of the collector until they are delivered to a regional location and picked up by courier or taken directly to the laboratory at which time the receiving laboratory is responsible for custody of the samples. Samples are tracked using the site number until the samples are submitted to the laboratory.

Upon arrival at the laboratory, samples are either assigned a unique identifier or tracked using the sample site location. The laboratory procedures are explained in detail in Appendix I.

13. Analytical Methods Requirements

The analytical method used for enumeration of *Enterococcus* sp. is Enterolert®, manufactured by IDEXX Laboratories Inc., Westbrook, ME. Enterolert® is a semi-automated, multiple-well, most probable number (MPN) method approved by US EPA (US EPA 40 CFR Part 136) for ambient water testing (Appendix I). This method provides results within 24 hours of sample incubation.

14. Quality Control Requirements

See Tables 3 and 4 for lab accuracy requirements. Laboratory QC requirements are detailed in Appendix I.

Field collection

All field monitors attend an annual training session, see section 8 above for more detail. During the monitoring season, a sub-set of monitors receive a one-on-one field follow-up/observation training where a performance checklist (Appendix J) is completed for each monitor and when needed, the monitor receives another 2-hour extensive training. When necessary, the monitor is asked to review the previously signed MHB Monitor Expectations (Appendix G) and meet with the MHB Coordinator and/or local beach manager to discuss any issues and corrective actions. If the issue(s) are not resolved, a new person is identified and trained to collect samples. A meeting is scheduled with the local beach manager as necessary to resolve any issues.

For each monitoring event when routine samples are collected, 10% of all samples are duplicated in the field. The sites are chosen based on the local capacity to collect the additional samples and at sites where the bacteria results are consistency above the detection limit. In the event one of the samples is below the safety threshold, and the other is above, the site is resampled to determine the sanitary quality of that location. Additionally, the Relative Percent Difference (see Section 7; Appendix E) of field duplicates is assessed on a monthly basis during the course of the season. If a location does not meet the acceptable Warning Limit, an observation is scheduled and if necessary, appropriate actions are taken with the monitor and/or beach manager. For data

that exceeds the established Control Limit, further investigation and actions are taken as necessary.

Laboratory Analysis
All analytical quality control is the responsibility of each laboratory with support from the MHB Program and agency partners. Nelson Analytical and Portland Water District are certified by the Maine Laboratory Certification Program for Enterolert®. Each laboratory is assessed at the start of each season using an extensive checklist as well as daily and monthly checks of the Enterolert® method during the season. Laboratories must also successfully analyze at least one set of proficiency test samples once every 12 months (Appendix I).

In the event of complications, the MHB Program Coordinator is notified, the issue is evaluated, and a solution determined. All corrective actions are recorded and filed in the QC Notebook. During the course of the season, 10% of all samples are duplicated in the laboratory. In the event a sample is below the safety threshold and the other is above, the site is resampled to determine the sanitary quality of that location.

Additionally, the Relative Percent Difference of laboratory duplicates is assessed on a monthly basis during the course of the season and again after the season has ended. If a location does not meet the acceptable Warning Limit, the MHB Coordinator works with the laboratory directly to resolve issue(s) in a timely manner. For data that exceeds the established Control Limit, MHB utilizes the expertise of agency partners when necessary. In the event the laboratory is not able or is unwilling to comply, MHB staff explores other feasible options for processing samples.

15. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Samples are collected in sterile whirl-Pak bags using sampling tongs. If a bag is contaminated during the sample collection process, it is discarded, replaced with a new sterile bag, and the sample is retaken. Monitors are trained to use aseptic technique while collecting samples. Monitoring equipment is rinsed and cleaned using sterile distilled water (refractometer) or fresh water (thermometer, pipette) following each monitoring effort to ensure the sanitation and integrity of the equipment. Each monitoring kit is checked for completeness before and after each monitoring event, cleaned, and stored properly. For laboratory equipment cleaning/maintenance, see Appendix I.

16. Instrument Calibration and Frequency

Waterproof thermocouple thermometers are used for monitoring and are checked against a NIST-certified thermometer at the beginning of each season and as needed. Hand-held refractometers are calibrated with distilled water at each beach station during each monitoring event. The accuracy of the thermometers and refractometers are verified at least once during the season when UMaine/SG staff conducts field observational trainings. All equipment is collected at the end of the season, cleaned and checked for any malfunctions, and stored at the UMaine Extension facility in Waldoboro, ME until the following spring when items are checked before distribution. For laboratory equipment, see Appendix I.

17. Inspection/Acceptance Requirements for Supplies

Field supplies are purchased from a scientific supply company and inspected upon receipt. Supplies that are determined to be deficient are returned and exchanged for intact items. For laboratory supplies, inspection/acceptance details are provided in Appendix I.

18. Data Acquisition Requirements

The only outside data acquired by the program is for tidal stage. The monitors report the observed tidal stage on the field datasheet, and once the time of sample collection is entered into the database, an automated tide stage calculator generates the tidal stage. This information is based on data collected via the National Oceanographic and Atmospheric Administration's tide buoys with a tidal offset used for each beach location.

19. Data Management

Data management procedures are divided into pre-season, during-season, and post-season tasks as detailed in Appendix K. Pre-season tasks consist of database updates, tests, and training. During-season tasks are concerned with handling of online datasheets, postings, and RPDs. Post-season tasks performed by UMaine Extension/SG are concerned with monitoring data, public notifications, data requests, and RPDs. Post-season tasks performed by Maine DEP are concerned with QA/QC procedures.

20. Assessment and Response Actions

If participating towns/parks do not uphold the terms of the MHB Agreement, actions are taken to resolve any issues. There is no routine assessment or simple response as the course of action depends on the circumstances. In the event the town/park is not able to meet the terms of the Agreement and/or qualifications for participation change, data is not collected or reported. Any data collected outside of the program's quality assurance project plan is not accepted. In the event the routine beach data is considered unreliable, the site is retested as soon as possible. If retesting is not possible during the same week of the scheduled monitoring day, the site is tested on schedule the following week. MHB does not recommend advisories/closures based on unreliable data. In the event a field monitor is not capable of meeting the established criteria and protocols (see Section14; Appendix J), a new person is identified and trained to collect samples.

During the monitoring season, the magnitude of a single sample exceedance in conjunction with the geometric mean are routinely assessed. Following an exceedance, the frequency of monitoring increases until levels are within acceptable limits. If there are known human sources of fecal pollution and/or bacteria levels consistently exceed guideline levels, MHB recommends the area be permanently posted until the issues are resolved and water quality has improved. The advisory/closure status is revoked as water quality improvements allow. At the end of the season, the percent of exceedances for each monitoring location and the number of advisory days for each beach management area are assessed. Corrective actions can be required to identify and eliminate sources of pollution, regardless of posted advisories/closures. Pollution sources that are identified should be addressed by the appropriate entity and eliminated as soon as possible.

When feasible, exceedances of established standards are investigated by means of intensified monitoring, a field survey of sanitary conditions, or other appropriate means to determine sanitary quality of the shoreline, freshwater inputs, and neighboring watershed areas. Intensive monitoring involving research scientists from the state and federal level can be necessary to address contamination issues. Every 5 years (or more frequently if conditions change), MHB evaluates pollution risk and potential/actual sources via a Risk Assessment Matrix (Appendix L), and in some cases, through GIS mapping and analysis and other pollution source-tracking efforts. MHB uses this risk-based ranking system to inform the classification and monitoring regime for each beach management area and to determine the need for an in-depth sanitary survey.

For assessment and response actions regarding field collection and lab analysis procedures see section 14, above.

21. Reports

Quality Control

All QC issues are documented in the QA/QC Notebook and reviewed at the end of the season to determine if further corrective actions are necessary. MHB works directly with the local town/park and/or laboratory to resolve issues. If necessary, MHB seeks the expertise of partners and/or the MHB Technical Advisory Committee to determine the best course of action. This can require a summary report that will be distributed to appropriate staff, local beach managers, program partners, stakeholders, and others.

Grant Requirements

A written report is produced annually at the completion of US EPA grant award cycle. All sampling and notification data is submitted to US EPA databases (STORET and PRAWN) annually (by January 31) as a grant condition authorized by SEC. 406 (b)(3)(A). Other reports (e.g. special studies, public reports, illness reports) are published as the need arises.

Illness Reporting

The public is informed regarding reporting illnesses they suspect were contracted from recreational water contact via MHB beach signs and the program website. They are urged to see a physician and report the incident to the Maine Center for Disease Control. An additional illness-reporting tool is currently under review. Beach managers and monitors are also encouraged to inform the public regarding the next steps for illness reporting (Figure 4).

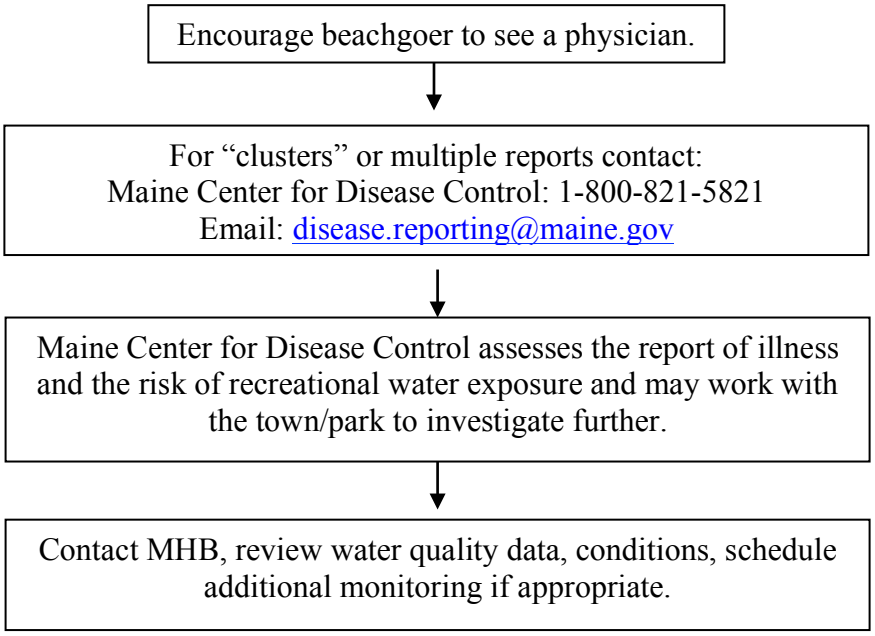

Figure 4. Illness reporting guidance.

22. Data Review, Validation and Verification Requirements

During the monitoring season, all beach notification data, field notes, laboratory results, and metadata are quality checked by UMaine/SG staff and laboratory technicians. Any discrepancies

are addressed immediately by contacting the appropriate laboratory manager and/or the local beach manager. For more details, see Appendix K: MHB Data Management SOP.

23. Validation and Verification Methods

For details on pre, during and post-season methods, see Appendix K: MHB Data Management SOP.

24. Reconciliation with Data Quality Objectives

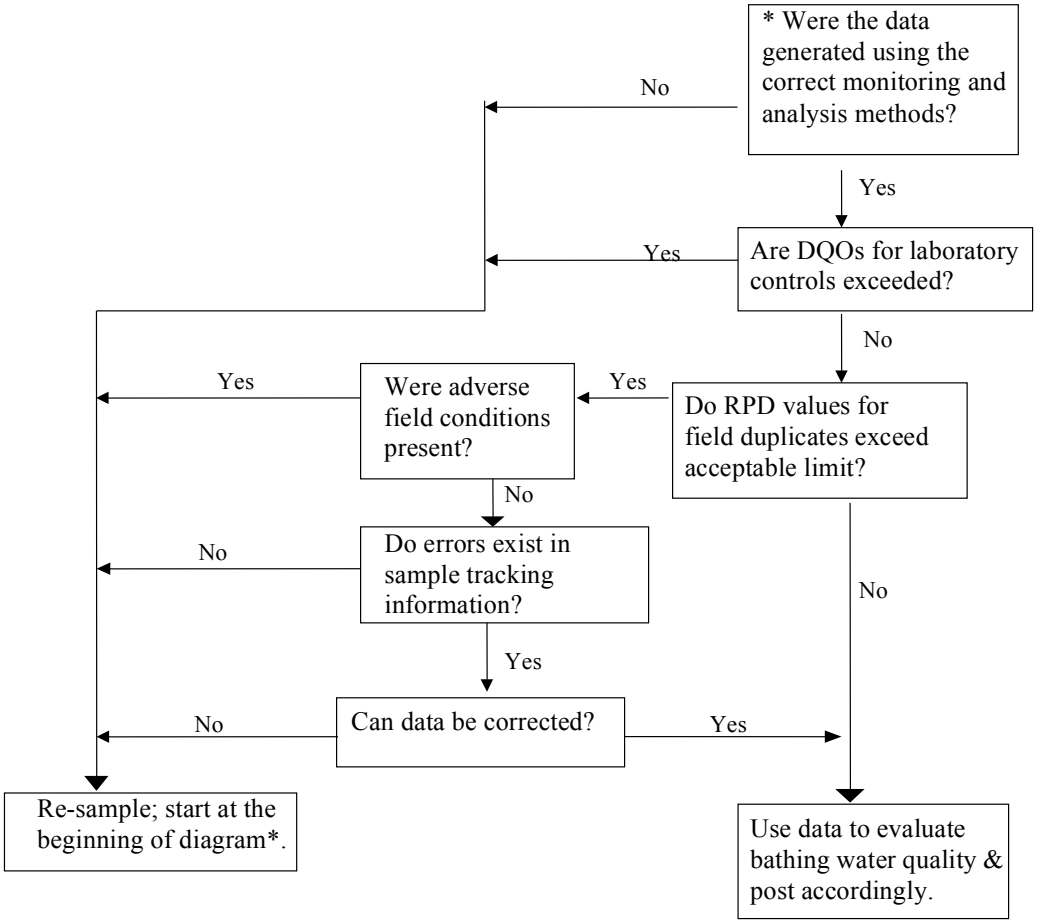

Figure 5. Data review decision tree.

25. References

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